

**ABSTRACT**

This invention relates to devices and methods for performing active, multi-step molecular and biological sample preparation and diagnostic analyses employing

- 5 immunochemical techniques. It relates generally to bioparticle separation, bioparticle enrichment, and electric field-mediated immunochemical detection on active electronic matrix devices utilizing AC and DC electric fields. More specifically, the invention relates to devices and methods for sample preparation/manipulation, immunoimmobilization, and immunoassays, all of which can be conducted on one or more active electronic chip devices
- 10 within a single system. These manipulations are useful in a variety of applications, including, for example, detection of pathogenic bacteria and biological warfare agents, point-of-care diagnostics, food or medical product quality control assays, and other biological assays.